A METHOD OF *Ascertaining the Latitude* IN THE NORTHERN HEMISPHERE, BY A *SINGLE ALTITUDE* OF THE POLAR STAR, *AT ANY TIME;* WITH TABLES COMPUTED FOR THAT PURPOSE.

By JOHN STEVENS,

In the Service of the East India Company.

Cambridge:

Printed by F. HODSON, at the Corner of Green-Street.

And Sold by W. HEATHER, Leadenhall-Street, London.

1800.

Entered at Stationers Hall.

TO

THE HONOURABLE

THE

COURT OF DIRECTORS

OF THE

UNITED COMPANY OF MERCHANTS

OF ENGLAND

TRADING TO THE EAST INDIES,

THIS

METHOD OF ASCERTAINING THE LATITUDE

IN THE NORTHERN HEMISPHERE,

IS, WITH THE GREATEST RESPECT,

DEDICATED

BY THEIR MOST OBEDIENT

HUMBLE SERVANT,

JOHN STEVENS.

As cloudy or hazy Weather, and fogs, very frequently prevent taking Obſervations of the Sun or Stars when they are upon the Meridian, the following method of aſcertaining the Latitude is offered; as it will anſwer at any time of the night in the Northern Hemiſphere, if there ſhould be an interval of clear Weather; and, it is hoped, it will be found ſcarcely more difficult than that by a Meridian Altitude.

The little trouble that attends it will be compenſated by the advantages of an additional method of acquiring the Latitude; advantages which need not be pointed out to Navigators.

The only requiſites in this method, are, an Altitude of the Polar Star, and the *apparent* Time. †

When it is ſaid that this method is nearly as eaſy as that which is moſt commonly uſed, the time is ſuppoſed to be nearly correct; but as this is not always the caſe, it will be proper to ſtate, what the error of Latitude ariſing from an error in the time, may amount to.

If the time ſhould be twenty minutes wrong, when the ſtar is upon the meridian, both above and below the Pole, the error will be ſcarce any thing, and can never at its greateſt diſtance from the meridian, exceed nine miles and a quarter.

It is generally allowed, that a pretty good Obſerver may, with a Hadley's Quadrant, take the Altitude of a Star, within about four minutes of the truth, when the horizon of the Sea is tolerably clear.* If a ſet of Altitudes of a proper Star for correcting the watch, be taken nearly at the ſame time, with the Altitude of the

† To find the Latitude by the Altitude of any other Star, taken when it is not upon the Meridian, requires a much longer proceſs, as well as an exactneſs of time, not neceſſary by an Altitude of the Polar Star; any *probable* error in the time having little effect upon the Latitude ſo found.

* This error, if it be ſo great, will be principally owing to the Horizon not being perfectly defined.

Polar

Polar Star, the amount of the errors resulting from taking the altitude of the Polar Star, in the time deduced from the Altitude of the other Star, in these Tables, and in the use of them, will not exceed 5 miles in the Latitude; in the present improved state of Instruments and their use, the error can scarcely ever be so much. † Should the Latitude have been obtained from a Meridian Altitude of a Star to the Southward of the Observer, if an Altitude of the Polar Star be immediately taken, and the Latitude ascertained by this method, using the Right Ascension of the Star observed to the Southward, increased by the time it has passed the Meridian, for the Right Ascension of the Mid-heaven, the mean of the Latitudes found by both Stars, will be nearly one-half nearer the truth, than that found by either of them separately; as the errors of observing, as far as they arise from any defect of the Horizon, will be likely to correct each other.

The Principles, Description, and Use of the Tables.

The Polar Star is supposed to be in 88° 15′ North Declination, which is 1° 45′ from the North Pole; now it will be evident, that the Polar Star will describe a circle round the Pole, the Radius of which will be equal to 1° 45′, and that its apparent motion round the Pole will be regular; its greatest elevation above the Pole, or depression below it, must be 1° 45′, equal to its distance from the Pole.

As all cœlestial Objects are at their greatest Altitude on the Meridian, when the right Ascension of the Mid-heaven or Meridian is the same with that of the Star, the Star must be at its greatest Altitude, or 1° 45′ above the Pole.

The Polar Star's Right Ascension is supposed to be 52′ 30″, therefore when the Right Ascension of the Mid-heaven is 52′ 30″ the Star will be upon the Meridian.

If the Observer be at the Equator, the Pole will be in the Horizon, the Star's greatest Altitude will be 1° 45′ at 52′ 30″ Right Ascension of the Mid-heaven; at

† If Altitudes of a Star on each side of the Meridian, be taken for finding the time, it will *probably* reduce the error of time one half.

6th

6^h 52′ 30″ it will be in the Horizon; at 12^h 52′ 30″ it will be at its greatest depression below the Horizon 1° 45′; and at 18^h 52′ 30″ it will again be in the Horizon, or have no Altitude. Now as its motion is regular, it is only necessary to compute for one Quarter of its Orbit round the Pole, as it will be the same in each quarter. This at first was done by means of Mr. Garrard's Traverse Tables, using 1° 45′ equal to 105′ for the Hypotenuse, and the distance of the Star from the Meridian, which is equal to the Right Ascension of the Mid-heaven diminished by 52′ 30″, for one of the Angles, by which means the Altitude was found true to Minutes and to five Decimal places, using his radical Tables; but as this method would be true only in Plane Trigonometry, every altitude was computed to the Right Ascension of the Mid-heaven down the first Column, Table 1. by the following rule:—To the Logarithm of the natural versed sine of the difference between the Right Ascension of the Star and that of the Mid-heaven, expressed in degrees, minutes, and seconds, add the Logarithmic co-sine of the Star's Declination; find the natural number answering to the sum (rejecting 10 in the index), which added to the natural versed sine of the Meridional co-Altitude of the Star, will give the co-versed sine of the true altitude.

When the Pole is elevated, the Star will always (except when upon the Meridian, either above or below the Pole) be lower than shewn by the correction in Table 1. when applied to the Elevation of the Pole, with a contrary sign to that in the Tables, and more so, the higher the Latitude. Table 2. contains what that difference is at each of the Latitudes specified at the top, and at the Right Ascension of the Mid-heaven, expressed at the side, and was computed by the following Rule. To the Logarithm of the natural versed sine of the Star's Meridian Distance, in degrees, minutes, and seconds, add the Logarithmic Co-sines of the Latitude at the top, and of the Star's Declination; find the natural number answering to the above sum (rejecting

Tens in the Index), which being added to the natural versed sine of the star's Meridional co-Altitude above the Pole, will give the true Altitude; now the difference between this altitude, decreased by the Latitude used in the operation, and the correction in Table 1. for the same Right Ascension of the Mid-heaven, is the corresponding correction in Table 2. for each of the Latitudes at the top of the Columns. Table 2. to minutes and seconds, is the immediate result of this comparison, and the one to minutes and tenths, is found by reducing the seconds to decimals of a minute.

Table 1. has five columns; the middle column contains the difference between the Altitude of the Pole and the Polar Star; the other four columns contain the Right Ascension of the Mid-heaven, to every 10 minutes, within two hours of the Star's being upon the Meridian, both above and below the Pole, and to every 5 minutes for the rest of the 24 hours; the correction of Altitude is to be *subtracted* when the Right Ascension of the Mid-heaven is found in one of the two columns to the left, and to be *added* when it is found in one of the two columns to the right, as directed in the columns of Right Ascension of the Mid-heaven. For example: when the Right Ascension of the Mid-heaven is $4^h\ 20'$, the corresponding correction $1^\circ\ 4', 8$ is to be subtracted from the observed Altitude of the Polar Star, to find the elevation of the Pole nearly. Or suppose the Right Ascension of the Mid-heaven to be $18^h\ 26'\ 40''$, then the corresponding correction $9'\ 32''$ is to be added to the observed Altitude, and it will give the elevation of the Pole nearly.

Table 2. is a Table of corrections to be added to the Latitude as found by the assistance of Table 1.

It consists of 13 columns, the one to the right and the one to the left containing the Right Ascension of the Mid-heaven, and the other 11 columns contain corrections for the Latitudes specified at the top of the columns. It is to be entered with the Right Ascension

or

of the Mid-heaven in one of the ſide columns, and the Latitude found by Table 1. at the Top; and the correſponding correction added to the Latitude firſt found, will give the true Latitude. For example: in 4^h 10′ Right Aſcenſion of the Mid-heaven, the Altitude of the Polar Star was obſerved to be 51° 3′, and the correction from Table 1. being applied to it, gives 49° 58′,2 for the firſt found Latitude; with this enter Table 2. at the top, and the Right Aſcenſion of the Mid-heaven 4^h 10′ at the ſide, and the correction is 1′,2, which added to Latitude, 49° 58′,2, will give 49° 59′,4 the true Latitude. Or ſuppoſe the Right Aſcenſion of the Mid-heaven to be 18^h 26′ 40″, and the Altitude obſerved to be 52° 37′ 45″, the correction from Table 1. which is 9′ 32″, being added to the Altitude, will give 52° 47′ 17″, which will be the Latitude near the truth. Enter Table 2. with the Right Aſcenſion of the Mid-heaven, and Latitude 52° 47′ at the top, and the correſponding correction taken by proportion, which will always be near enough, will be 2′ 5″, which being added to the Latitude firſt found, will give 52° 49′ 22″, the true Latitude. †

† It is to be obſerved, that the argument at the top of the columns is the true Latitude, therefore a ſmall error will ariſe from taking the Latitude found by Table 1. but this may always be obviated by going through the operation again, with the Latitude laſt found.

To

To find the Latitude by these Tables.

With the time, find the Right Aſcenſion of the Mid-heaven as follows: To the Sun's Right Aſcenſion, add the time from the laſt noon, the ſum (rejecting 24 hours if it exceed that ſum) will be the right Aſcenſion of the Mid-heaven or Meridian.

Let an Altitude of the Polar Star be taken, and the time noted by a watch; correct the Altitude for Refraction (and dip of the Horizon if the Obſervation be made with the Horizon of the Sea.)

Apply the error of the watch to the time noted, if there be any error, and find the Right Aſcenſion of the Mid-heaven as above, with which enter Table 1. and there will be found a correction to be *added* to or *ſubtracted* from the Altitude, as directed in the column of Right Aſcenſion of the Mid-heaven; this will give the Latitude near the truth.

Enter Table 2. with the Latitude thus found at the top, and the Right Aſcenſion of the Mid-heaven at the ſide; the correſponding correction *added* to the Latitude found as above, will give the true Latitude.

It is to be premiſed, that in the following examples, Nautical time is uſed; that is to ſay, Sept. 10th, 1798, at $10^h\ 5'\ 34''$ is $10^h\ 5'\ 34''$ after noon on the 9th.

Examples.

I. September 10th, 1798, at $10^h\ 5'\ 34''$ the Altitude of the Polar Star was obſerved to be 26° 46′ in Longitude 38° 20′ weſt, the height of the eye being 20 feet above the level of the Sea.

Time . .		$10^h\ 5'\ 34''$	Altitude .		26° 46′
Sun's Right Aſcenſion for noon		11 12 5	Refraction .	—	1,8
			Dip of the Horizon	—	4,3
Correction for Longitude 38° 20′W. and for $10^h\ 6'$ Table XXIII. requiſite Tables.	+	1 54	True Altitude .		26 39,9
			Correction Table 1.	—	1 2,9
			Latitude near the truth		25 37
			Correction Table 2.	+	,5
Right Aſcenſion of Mid-heaven		21 19 33	True Latitude .		25 37,5 N

II. September

II. September 21st, 1798, in Longitude 37° 40′ W. at 3^h 40′ in the morning, the Latitude was observed by the Meridian Altitude of Jupiter to be 37° 47′ 30″ N. about 1 minute afterwards, the Altitude of the Polar Star was observed to be 39° 9′ 30″, the height of the eye being 19 feet above the level of the Sea.

Time .	15^h 41′	0″	
Sun's Right Ascension at noon	11	51	37
Correction for 15^h 41′ and 37° 40′ W.	+	2	44
Right Ascension of Mid-heaven .	3	35	21

Altitude	39°	9′	30″
Refraction .	—	1	10
Dip of the Horizon	—	4	10
True Altitude .	39	4	10
Correction Table 1.	—1	19	35
Latitude near the truth	37	44	35
Correction Table 2.	+		33
Latitude by the Polar Star	37	45	8 N
Latitude by Jupiter	37	47	30 N
Mean Latitude	37	46	19 N

III. September 23d, 1798, in Longitude 34° 19′ W. the Latitude was observed to be 39° 51′ N. by a Meridian Altitude of Rigel, at the same time, the Altitude of the Polar Star was observed by another person to be 40° 43′, the height of the Observer's eye being 19 feet above the level of the Sea.

Right Ascension of Rigel, which is the same with that of the Mid-heaven	5^h 4′ 52″

In this instance, the Latitudes agree near enough, without any correction.

Altitude observed .	40°	43′
Refraction . .	—	1,1
Dip of the Horizon	—	4,2
True Altitude .	40	37,7
Correction Table 1.	—	47,5
Latitude near the truth	39	50,2 N
Correction Table 2.	+	1,1
True Latitude .	39	51,3 N

IV. December 31st, 1799, at Cambridge, at 5^h 44′ 20″ the Altitude of the Polar Star was observed to be 53° 57′ 45″;

Sun's Right Ascension at noon	18^h	38′	46″
Correction for 5^h 44′	+	1	3
Time .	5	44	20
Right Ascension of the Mid-heaven		24	9

Altitude .	53°	57′	45″
Refraction .	—		41
True Altitude	53	57	4
Correction Table 1.	—1	44	12
Latitude near the truth	52	12	52 N
Correction Table 2.	+		2
True Latitude	52	12	54 N

When there is so much uncertainty in the time as to make it necessary, or adviseable, to take Altitudes of a cœlestial object for ascertaining it, the time may be found from them by either of the methods in the requisite Tables, or by any of those in Mr. Mackay's valuable Treatise on the Theory and Practice of finding the Longitude. Mr Mackay's method by the rising or setting of a cœlestial object, may be particularly useful for this purpose.

TABLE I.

Right Ascension of the Mid-heaven, the correction of Altitude to be *subtracted*. — Correction of Altitude. — Right Ascension of the Mid-heaven, the correction of Altitude to be *added*.

H ′	H ′	° ′ ″	H ′	H ′
52½	52½	1. 45. 0	12. 52½	12. 52½
1. 0	45	1. 44. 57	13. 0	12. 45
1. 10	35	1. 44. 42	13. 10	12. 35
1. 20	25	1. 44. 15	13. 20	12. 25
1. 30	15	1. 43. 36	13. 30	12. 15
1. 40	5	1. 42. 45	13. 40	12. 5
1. 50	23. 55	1. 41. 43	13. 50	11. 55
2. 0	23. 45	1. 40. 29	14. 0	11. 45
2. 10	23. 35	1. 39. 3	14. 10	11. 35
2. 20	23. 25	1. 37. 26	14. 20	11. 25
2. 30	23. 15	1. 35. 38	14. 30	11. 15
2. 40	23. 5	1. 33. 39	14. 40	11. 5
2. 50	22. 55	1. 31. 30	14. 50	10. 55
3. 0	22. 45	1. 29. 10	15. 0	10. 45
3. 5	22. 40	1. 27. 56	15. 5	10. 40
3. 10	22. 35	1. 26. 39	15. 10	10. 35
3. 15	22. 30	1. 25. 21	15. 15	10. 30
3. 20	22. 25	1. 23. 59	15. 20	10. 25
3. 25	22. 20	1. 22. 36	15. 25	10. 20
3. 30	22. 15	1. 21. 10	15. 30	10. 15
3. 35	22. 10	1. 19. 41	15. 35	10. 10
3. 40	22. 5	1. 18. 11	15. 40	10. 5
3. 45	22. 0	1. 16. 38	15. 45	10. 0
3. 50	21. 55	1. 15. 3	15. 50	9. 55
3. 55	21. 50	1. 13. 26	15. 55	9. 50
4. 0	21. 45	1. 11. 46	16. 0	9. 45
4. 5	21. 40	1. 10. 5	16. 5	9. 40
4. 10	21. 35	1. 8. 22	16. 10	9. 35
4. 15	21. 30	1. 6. 36	16. 15	9. 30
4. 20	21. 25	1. 4. 49	16. 20	9. 25
4. 25	21. 20	1. 3. 0	16. 25	9. 20
4. 30	21. 15	1. 1. 9	16. 30	9. 15
4. 35	21. 10	59. 17	16. 35	9. 10
4. 40	21. 5	57. 22	16. 40	9. 5
4. 45	21. 0	55. 27	16. 45	9. 0
4. 50	20. 55	53. 29	16. 50	8. 55
4. 55	20. 50	51. 30	16. 55	8. 50
5. 0	20. 45	49. 30	17. 0	8. 45
5. 5	20. 40	47. 28	17. 5	8. 40
5. 10	20. 35	45. 24	17. 10	8. 35
5. 15	20. 30	43. 20	17. 15	8. 30
5. 20	20. 25	41. 14	17. 20	8. 25
5. 25	20. 20	39. 7	17. 25	8. 20
5. 30	20. 15	36. 59	17. 30	8. 15
5. 35	20. 10	34. 50	17. 35	8. 10
5. 40	20. 5	32. 40	17. 40	8. 5
5. 45	20. 0	30. 29	17. 45	8. 0
5. 50	19. 55	28. 17	17. 50	7. 55
5. 55	19. 50	26. 4	17. 55	7. 50
6. 0	19. 45	23. 50	18. 0	7. 45
6. 5	19. 40	21. 36	18. 5	7. 40
6. 10	19. 35	19. 21	18. 10	7. 35
6. 15	19. 30	17. 6	18. 15	7. 30
6. 20	19. 25	14. 50	18. 20	7. 25
6. 25	19. 20	12. 34	18. 25	7. 20
6. 30	19. 15	10. 17	18. 30	7. 15
6. 35	19. 10	8. 1	18. 35	7. 10
6. 40	19. 5	5. 43	18. 40	7. 5
6. 45	19. 0	3. 26	18. 45	7. 0
6. 50	18. 55	1. 9	18. 50	6. 5
6. 52½	18. 52½	0	18. 52½	6 52

RA of MH	10°	20°	30°	40°	45°	50°	55°	60°	65°	70°	75°	RA of MH
H ′	″	″	″	′ ″	′ ″	′ ″	′ ″	′ ″	′ ″	′ ″	′ ″	H ′
52½	0	0	0	0	0	0	0	0	0	0	0	52½
1. 30	1	1	2	2	3	3	4	5	6	7	11	15
2. 0	2	3	5	7	9	10	12	15	19	25	34	23. 45
2. 30	3	6	9	14	16	20	24	29	37	49	1. 8	23. 15
3. 0	5	10	16	23	28	33	40	49	1. 1	1. 19	1. 51	22. 45
3. 30	7	15	23	33	40	48	58	1. 10	1. 28	1. 54	2. 39	22. 15
4. 0	9	19	30	44	52	1. 2	1. 15	1. 32	1. 55	2. 29	3. 26	21. 45
4. 20	10	22	35	51	1. 1	1. 12	1. 27	1. 47	2. 13	2. 52	3. 58	21. 25
4. 40	12	24	39	57	1. 8	1. 22	1. 38	2. 0	2. 30	3. 14	4. 27	21. 5
5. 0	14	27	44	1. 4	1. 16	1. 31	1. 50	2. 13	2. 46	3. 34	4. 55	20. 45
5. 20	15	30	47	1. 9	1. 22	1. 38	1. 58	2. 24	2. 59	3. 51	5. 17	20. 25
5. 40	16	32	51	1. 14	1. 28	1. 45	2. 6	2. 33	3. 10	4. 5	5. 36	20. 5
6. 0	16	33	53	1. 17	1. 32	1. 49	2. 11	2. 40	3. 18	4. 15	5. 48	19. 45
6. 20	16	34	54	1. 19	1. 34	1. 53	2. 15	2. 44	3. 23	4. 22	5. 57	19. 25
6. 40	17	35	55	1. 20	1. 36	1. 54	2. 17	2. 46	3. 26	4. 24	5. 59	19. 5
7. 0	17	35	56	1. 20	1. 36	1. 54	2. 17	2. 46	3. 25	4. 23	5. 57	18. 45
7. 20	17	35	55	1. 19	1. 34	1. 53	2. 15	2. 43	3. 23	4. 18	5. 48	18. 25
7. 40	16	34	53	1. 17	1. 32	1. 49	2. 10	2. 38	3. 15	4. 9	5. 35	18. 5
8. 0	15	32	50	1. 13	1. 27	1. 43	2. 4	2. 30	3. 5	3. 56	5. 17	17. 45
8. 20	14	30	47	1. 9	1. 22	1. 37	1. 56	2. 21	2. 53	3. 40	4. 56	17. 25
8. 40	13	27	43	1. 3	1. 15	1. 30	1. 47	2. 9	2. 39	3. 22	4. 31	17. 5
9. 0	12	25	39	57	1. 8	1. 21	1. 37	1. 56	2. 23	3. 2	4. 3	16. 45
9. 20	11	22	34	51	1. 0	1. 12	1. 26	1. 43	2. 7	2. 41	3. 35	16. 25
9. 40	9	19	30	44	52	1. 2	1. 14	1. 29	1. 49	2. 19	3. 5	16. 5
10. 0	8	16	26	37	44	52	1. 2	1. 15	1. 32	1. 56	2. 35	15. 45
10. 30	5	12	18	27	31	37	45	54	1. 6	1. 24	1. 51	15. 15
11. 5	4	7	12	17	20	23	27	32	40	51	1. 7	14. 40
11. 35	2	4	6	9	10	12	15	17	21	27	35	14. 10
12. 5	1	2	3	4	4	5	6	7	8	10	14	13. 40
12. 52½	0	0	0	0	0	0	0	0	0	0	0	12. 52½

RULE.

Enter Table 1. with the Right Ascension of the Mid-heaven, in one of the side columns, and in the middle column will be found a Correction to be *added* to, or *subtracted* from, the Observed Altitude (corrected for Refraction,) as directed in the column of Right Ascension. This will give the Latitude near the truth.

Enter Table 2. with the Latitude thus found, at the top, and the Right Ascension of the Mid-heaven at the side; the corresponding Correction *added* to the Latitude found as above, will give the true Latitude.

TABLE 1.

Right Ascension of the Mid-heaven, the correction of Altitude to be *subtracted*. | Correction of Observed Altitude. | Right Ascension of the Mid-heaven, the correction of Altitude to be *added*.

H '	H '	° '	H '	H '
52½	52½	1. 45,0	12. 52½	12. 52½
1. 0	45	1. 44,9	13. 0	12. 45
1. 10	35	1. 44,7	13. 10	12. 35
1. 20	25	1. 44,2	13. 20	12. 25
1. 30	15	1. 43,6	13. 30	12. 15
1. 40	5	1. 42,8	13. 40	12. 5
1. 50	23. 55	1. 41,7	13. 50	11. 55
2. 0	23. 45	1. 40,5	14. 0	11. 45
2. 10	23. 35	1. 39,1	14. 10	11. 35
2. 20	23. 25	1. 37,4	14. 20	11. 25
2. 30	23. 15	1. 35,6	14. 30	11. 15
2. 40	23. 5	1. 33,7	14. 40	11. 5
2. 50	22. 55	1. 31,5	14. 50	10. 55
3. 0	22. 45	1. 29,2	15. 0	10. 45
3. 5	22. 40	1. 27,9	15. 5	10. 40
3. 10	22. 35	1. 26,7	15. 10	10. 35
3. 15	22. 30	1. 25,3	15. 15	10. 30
3. 20	22. 25	1. 24,0	15. 20	10. 25
3. 25	22. 20	1. 22,6	15. 25	10. 20
3. 30	22. 15	1. 21,2	15. 30	10. 15
3. 35	22. 10	1. 19,7	15. 35	10. 10
3. 40	22. 5	1. 18,2	15. 40	10. 5
3. 45	22. 0	1. 16,6	15. 45	10. 0
3. 50	21. 55	1. 15,1	15. 50	9. 55
3. 55	21. 50	1. 13,4	15. 55	9. 50
4. 0	21. 45	1. 11,8	16. 0	9. 45
4. 5	21. 40	1. 10,1	16. 5	9. 40
4. 10	21. 35	1. 8,4	16. 10	9. 35
4. 15	21. 30	1. 6,6	16. 15	9. 30
4. 20	21. 25	1. 4,8	16. 20	9. 25
4. 25	21. 20	1. 3,0	16. 25	9. 20
4. 30	21. 15	1. 1,2	16. 30	9. 15
4. 35	21. 10	59,3	16. 35	9. 10
4. 40	21. 5	57,4	16. 40	9. 5
4. 45	21. 0	55,4	16. 45	9. 0
4. 50	20. 55	53,5	16. 50	8. 55
4. 55	20. 50	51,5	16. 55	8. 50
5. 0	20. 45	49,5	17. 0	8. 45
5. 5	20. 40	47,5	17. 5	8. 40
5. 10	20. 35	45,4	17. 10	8. 35
5. 15	20. 30	43,3	17. 15	8. 30
5. 20	20. 25	41,2	17. 20	8. 25
5. 25	20. 20	39,1	17. 25	8. 20
5. 30	20. 15	37,0	17. 30	8. 15
5. 35	20. 10	34,8	17. 35	8. 10
5. 40	20. 5	32,7	17. 40	8. 5
5. 45	20. 0	30,5	17. 45	8. 0
5. 50	19. 55	28,3	17. 50	7. 55
5. 55	19. 50	26,1	17. 55	7. 50
6. 0	19. 45	23,8	18. 0	7. 45
6. 5	19. 40	21,6	18. 5	7. 40
6. 10	19. 35	19,4	18. 10	7. 35
6. 15	19. 30	17,1	18. 15	7. 30
6. 20	19. 25	14,8	18. 20	7. 25
6. 25	19. 20	12,6	18. 25	7. 20
6. 30	19. 15	10,3	18. 30	7. 15
6. 35	19. 10	8,0	18. 35	7. 10
6. 40	19. 5	5,7	18. 40	7. 5
6. 45	19. 0	3,4	18. 45	7. 0
6. 50	18. 55	1,1	18. 50	6. 55
6. 52½	18. 52½	0,0	18. 52½	6. 52½

Table 2.

RA of MH	10°	20°	30°	40°	45°	50°	55°	60°	65°	70°	75°	RA of MH
H ′	′	′	′	′	′	′	′	′	′	′	′	H ′
52½	,0	,0	,0	,0	,0	,0	,0	,0	,0	,0	,0	52½
1. 30	,0	,0	,0	,0	,0	,1	,1	,1	,1	,1	,2	15
2. 0	,0	,0	,1	,1	,1	,2	,2	,2	,3	,4	,6	23. 45
2. 30	,1	,1	,2	,2	,3	,3	,4	,5	,6	,8	1,1	23. 15
3. 0	,1	,2	,3	,4	,5	,6	,7	,8	1,0	1,3	1,9	22. 45
3. 30	,1	,2	,4	,6	,7	,8	1,0	1,2	1,5	1,9	2,6	22. 15
4. 0	,1	,3	,5	,7	,9	1,0	1,3	1,5	1,9	2,5	3,4	21. 45
4. 20	,2	,4	,6	,9	1,0	1,2	1,5	1,8	2,2	2,9	4,0	21. 25
4. 40	,2	,4	,7	1,0	1,1	1,4	1,6	2,0	2,5	3,2	4,5	21. 5
5. 0	,2	,4	,7	1,1	1,3	1,5	1,8	2,2	2,8	3,[illegible]	4,9	20. 45
5. 20	,2	,5	,8	1,2	1,4	1,6	2,0	2,4	3,0	3,[illegible]	5,3	20. 25
5. 40	,3	,5	,8	1,2	1,5	1,7	2,1	2,6	3,2	4,[illegible]	5,6	20. 5
6. 0	,3	,5	,9	1,3	1,5	1,8	2,2	2,7	3,3	4[illegible]	5,8	19. 45
6. 20	,3	,6	,9	1,3	1,6	1,9	2,3	2,7	3,4	4[illegible]	5,9	19. 25
6. 40	,3	,6	,9	1,3	1,6	1,9	2,3	2,8	3,4	4[illegible]	6,0	19. 5
7. 0	,3	,6	,9	1,3	1,6	1,9	2,3	2,8	3,4	4[illegible]	5,9	18. 45
7. 20	,3	,6	,9	1,3	1,6	1,9	2,2	2,7	3,4	[illegible]	5,8	18. 25
7. 40	,3	,6	,9	1,3	1,5	1,8	2,2	2,6	3,2	[illegible]	5,6	18. 5
8. 0	,3	,5	,8	1,2	1,5	1,7	2,1	2,5	3,1	[illegible]	5,3	17. 45
8. 20	,2	,5	,8	1,1	1,4	1,6	1,9	2,3	2,9	[illegible]	4,9	17. 25
8. 40	,2	,5	,7	1,0	1,3	1,5	1,8	2,2	2,7	[illegible]	4,5	17. 5
9. 0	,2	,4	,7	,9	1,1	1,4	1,6	1,9	2,4	[illegible]	4,1	16. 45
9. 20	,2	,4	,6	,8	1,0	1,2	1,4	1,7	2,1	[illegible]	3,6	16. 25
9. 40	,2	,3	,5	,7	,9	1,0	1,2	1,5	1,8	[illegible]	3,1	16. 5
10. 0	,1	,3	,4	,6	,7	,9	1,0	1,2	1,5	[illegible]	2,6	15. 45
10. 30	,1	,2	,3	,4	,5	,6	,7	,9	1,1	1,4	1,9	15. 15
11. 5	,1	,1	,2	,3	,3	,4	,5	,5	,7	,8	1,1	14. 40
11. 35	,0	,1	,1	,1	,2	,2	,2	,3	,3	,4	,6	14. 10
12. 5	,0	,0	,0	,1	,1	,1	,1	,1	,1	,2	,2	13. 40
12. 52½	,0	,0	,0	,0	,0	,0	,0	,0	,0	,0	,0	12. 52½

RULE.

Enter Table 1. with the Right Ascension of the Mid-heaven, in one of the side columns, and in the middle column will be found a Correction to be *added* to, or *subtracted* from, the Observed Altitude (corrected for Refraction,) as directed in the column of Right Ascension. This will give the Latitude near the truth.

Enter Table 2. with the Latitude thus found, at the top, and the Right Ascension of the Mid-heaven at the side; the corresponding Correction *added* to the Latitude as found above, will give the true Latitude.

About the middle of the year 1801, the Right Ascension of the Polar Star will be 52′ 30″, and its Declination 88° 15′ N. for that time these Tables are calculated. A correction will therefore be necessary, both before and after that time, to make them *accurate*; this may be found as follows:

Having found the Polar Star's true place, to correct the error of Right Ascension, *subtract* the quantity above or *add* what it wants, of 52′ 30″, from the Right Ascension of the Mid-heaven, before you enter the Tables. To correct the error of Declination, *subtract* if it be greater, or *add* if it be less than 88° 15′ N. $\frac{1}{105}$ for every minute, or $\frac{1}{6300}$ for every second, it is greater or less than 88° 15′, from the corrections in the Table to be applied to the Altitude.

Printed by F. Hodson, Corner of Green-Street, Cambridge.